SSVEO IFA List **Date:02/27/2003**

STS - 8, OV - 99, Challenger (3) **Time:04:30:PM**

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:02:36	Problem	**FIAR**	**IFA** STS-8-V-01	HYD
	GMT: 242:09:08		**SPR** 08F003	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Hydraulic Circulation Pump 2 Failed To Start. (ORB)

Summary: DISCUSSION: During hydraulic thermal conditioning at about 242:09:08 G.m.t., Hydraulic Circulation Pump 2 failed to start. Three starts were attempted on Main BUS B. Later the crew switched to Main BUS C and the pump ran for less than 4 seconds with the pressure rising to 180 PSI then decreasing back to system reservoir pressure. The pump switch was left on for approximately 15 to 20 minutes during which time current fluctuated from 40 to 150 amps, circulation pump body temperature went to 255?F, and hydraulic fluid temperature went to 230?F. The pump switch was then positioned to off and the pump was not used for the remainder of the mission.

CONCLUSION: The Hydraulic Circulation Pump 2 failure to start was probably caused by a circulation pump electronics failure. The exact failure mode will be established by a failure analysis at the vendor. CORRECTIVE_ACTION: Hydraulic Circulation Pump 2 was removed, replaced and returned to the vendor for failure analysis. This problem will be tracked on CAR 08F003. CAR ANALYSIS: Analysis revealed an internal short in the pump. Low pressure pump gears were jammed and the interconnecting splined motor/pump coupling was sheared. This is considered an isolated failure. Unit was scrapped except for useable parts. No further action planned. Close this CAR. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:05:53	Problem	**FIAR**	**IFA** STS-8-V-02	C&T
	GMT: 242:12:25		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Wireless Crew Communications Unit "A" Failed And Several Others Were Noisy. (ORB)

Summary: DISCUSSION: The crew reported that Wireless Crew Communications Unit (WCCU) "A" failed at 242:12:25 G.m.t. The failed unit was stowed and replaced by the "E" unit. The "E" unit was intermittent and noisy when used on the middeck. The "D" unit had loud continuous static in the normal WCCU mode, but worked fine when hooked up to the wall unit. The "B" unit had static when used away from the wall unit on the flight deck. The crew used one WCCU on each deck in the walkie-talkie mode for the latter part of the flight and had no WCCU problems.

Postflight analysis has shown that the unit "A" leg unit receiver squelch control was defective. After the control was replaced, the "A" system worked properly. No progress has been made in identifying the cause of the noise problems observed during the flight since they cannot be duplicated on the ground. CONCLUSION: The WCCU "A" leg unit receiver squelch control was defective. The source of the "noise" on units "B", "D" and "E" appears to exist only onboard during a mission and cannot be recreated in the laboratory. CORRECTIVE_ACTION: The squelch control on the unit "A" leg unit has been removed and replaced. All units will be retested and returned to KSC. Additionally, 35-volt capacitors have been incorporated in the power supply circuits which corrects previous flight failures. All units now have received a 48-hour burn-in. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:01:28	Problem	**FIAR**	**IFA** STS-8-V-03	MECH
	GMT: 242:08:00		**SPR** 08F018	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Starboard Payload Bay Door Open "A" Late Indication. (ORB)

Summary: DISCUSSION: When the payload bay doors were opened, the starboard door open "A" indication occurred 57 seconds later than expected. The open "B" indication occurred as expected at 52 seconds, coinciding with the two-motor door-opening time. Current data shows that motor no. 1 continued to operate the torque limiter (even though the door was open and even after the late open "A" indication occurred) until the automatic door open sequence in the software cut off at 192 seconds after both doors were open. The payload bay doors were closed successfully using the manual mode of operation.

The problem was repeated at KSC and a faulty limit switch was found on the starboard motor no. 1 rotary actuator. Since motor no. 1 did not stop at 109 seconds when the door open "A" indication finally did occur both the faulty limit switch and MCA-1 (motor control assembly-1) were removed for failure analysis. The failure analysis of the limit switch showed that the wires were wrapped around the limit switch pins but were not soldered. This condition degraded to a high series-resistance connection as a result of the repeated launch vibrations. The high resistance condition could have caused the late open indication (seen in the flight data) while preventing sufficient current for activation of the relay that shuts the motor off. The MCA test was successful with no indications of a problem. CONCLUSION: A high series resistance

connection in the limit switch caused the starboard payload bay door open "A" indication to be late. The failure was the result of solder not being applied to the connection in the limit switch. CORRECTIVE_ACTION: The switch has been replaced. Should this failure occur on subsequent flights the manual mode may be used to open and close the doors. The limit switch failure analysis will be tracked on CAR 08F018. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** 000:06:44	Problem	**FIAR**	**IFA** STS-8-V-04		RMS
	GMT: 242:13:16		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: RMS Manipulator Positioning Mechanism Had Improper Forward Deployed Indication. (RMS)

Summary: DISCUSSION: At 242:13:16 G.m.t., one of the two RMS Manipulator Positioning Mechansim (MPM) deploy indications (V54X0812E) on the forward pedestal failed to transfer when the MPM was deployed. On flight day 4, however, the indication was normal during the MPM deployment.

Postflight, the switch was electrically functional, however, the mechanical actuation mechanism adjustment was marginal and the switch was re-rigged per specification. CONCLUSION: The anomalous switch indication was caused by improper adjustment of the switch mechanical actuation mechanism. CORRECTIVE_ACTION: The switch mechanical actuation mechanism was re-adjusted per specification. EFFECTS_ON_SUBSEQUENT_MISSIONS: None

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Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** 000:01:28	Problem	**FIAR**	**IFA** STS-8-V-05		APU
	GMT: 242:08:00		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: APU Seal Cavity Drain Leak. (ORB)

Summary: DISCUSSION: At about 282:08:00 G.m.t., the APU 2 pump drain line pressure started a slow decay which dropped the line pressure to 1 PSIA after a 24 hour period. The seal cavity pressure remained at 1 PSIA for the remainder of the mission.

APU seal cavity pressure decay has occured on each shuttle mission with substantial effort being unsuccessfully expended in trying to determine the cause of the leak. Small APU seal cavity drain leaks are not considered harmful to the operation of the APU. A positive pressure maintained on the APU gear box will keep fuel out of the gear box. Should the pump drain line pressure leak to 0 PSIA and a major fuel leak occurs, freezing and blocking of the pump drain line is possible. A standard procedure has been developed at KSC for performing APU pump drain line pressure decay troubleshooting. CONCLUSION: APU seal cavity drain leaks have occurred on previous

missions with no effect on APU operations. See problems STS-4-15, 6-13 and 7-9. Small leaks in APU pump drain lines are acceptable for flight.
CORRECTIVE_ACTION: APU 2 will be leak checked using standard procedures prior to readiness for flight. APU seal cavity drain leaks on future missions will be resolved using the standard leak detection procedures at KSC via the OMRSD, but they will not be carried on the problem tracking list.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:06	Problem	**FIAR**	**IFA** STS-8-V-06	INS
	GMT: 242:06:38		**SPR** 08F010, 08F014	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Operational Instrumentation Failures. (ORB)

Summary: DISCUSSION: A. SSME 2 GH2 pressurization outlet pressure sensor (V41P1260A) failed offscale high at 403 seconds - the sensor has failed on STS-1, 2, 6 and 7. The sensor was operational on STS-8 for a sufficient period to determine the operational status of the flow control valve. The problem is caused by a high vibration environment. A redesigned sensor mounting will be added when a new design pressurization valve is installed. The sensor will be replaced prior to the next OV-099 flight.

B. Right OMS pod fuel tank temperature (V43T5315A) erratic - the same problem was seen on STS-7 and has been isolated to the sensor. Replacement requires OMS pod removal; therefore, fly as is until pod is removed, and use the right RCS temperatures as a backup. The launch commit criteria for this measurement has been deleted. C. SSME 2 LH2 inlet pressure (V41P1200C) failed off-scale high at T+495 seconds - the problem has been isolated to the transducer and it has been replaced. This failure was also seen on STS-3 and was the result of a broken wire within the transducer. The STS-8 transducer has been returned to the vendor for failure analysis and will be tracked on CAR 08F010. [CAR ANALYSIS: Supplier could not verify the problem. No further analysis at this time. Close this CAR.] [not included in original problem report] D. SSME 1 main fuel valve downstream temperature 2 (E41T1154A) failed - troubleshooting isolated the problem to an open circuit in the sensor. The sensor will be replaced before this engine is flown again. E. APU 3 gearbox lubrication oil outlet temperature (V46T0354A) biased - the measurement lagged the lubrication oil temperature. The sensor was replaced and the checkout was satisfactory. The failure will be tracked on CAR 08F014. [CAR ANALYSIS: No evidence was found that would support any contention that the ullage pressure signal conditioners malfunctioned during STS-8.] [not included in original problem report] F. External tank LH2 ullage pressures No. 1 (T41P1700C) and No. 3 (T41P1702C) indicated a constant pressure for approximately 200 seconds during ascent and the external tank LOX ullage pressure No. 3 (T41P1752C) read low - these transducers are of the potentiometer type and have a history of stiction failures as far back as MPTA (Main Propulsion Test Article) testing. Stiction tests and the failure history show that these transducers will become free after sticking within less than 0.5 psi. On-going actions include: 1. Adjusting or modifying the sensor to minimize stiction; 2. Improving tests to screen for stiction; 3. Investigating opening the allowable limits of 33 plus/minus 1 psia; and, 4. Investigating a transducer change with minimum Orbiter wiring impact. The signal conditioners for all three LH2 ullage measurements will be replaced with an upgraded design prior to the next OV-099 flight. The external tank LOX ullage pressure No. 3 sensor had a 0.4 psi bias when compared to the other two LOX ullage

pressure measurements and test data. Orbiter wiring will be tested to assure that there is no erroneous circuit resistance. The Orbiter signal conditioners will be replaced with an upgraded design prior to the next flight of the OV-099 vehicle. CONCLUSION: See previous discussions of each problem. CORRECTIVE_ACTION: See previous discussions of each problem. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:11:22	Problem	**FIAR**	**IFA** STS-8-V-07	C&T - S-Band
	GMT: 242:17:54		**SPR** 08F007	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Power Right S-Band Quad Antenna Beam Position Miscompare. (ORB)

Summary: DISCUSSION: At about 242:17:54 G.m.t., a lower right S-band quad antenna position miscompare alarm occurred on system 2 when the GPC (general purpose computer) selected the aft beam. After switching to the system 1 electronics, the miscompare was still present. Since communications through TDRS were maintained with system 2 on the aft beam, the coaxial relay had transferred RF power output from the forward beam to the aft beam position. The coaxial relay position talkback microswitch was suspect since it is actuated by the same electromechanical mechanism as the coaxial contacts.

The alarm was inhibited. There was no effect on system 2 antenna beam switching for the remainder of the flight. Loss of the lower right S-band quad antenna beam position talkback indication had no impact on communications or flight operations. Postflight analysis of the antenna-to-TDRS look angles confirmed that the beam switching coaxial relay contacts were proper when commanded to the aft position at the time of the anomaly. The probable cause of the antenna beam position miscompare is a failed position talkback microswitch inside the coaxial relay. All S-band quad antennas on OV-099 are scheduled to be removed and replaced before STS-11. The S-band quad antenna on OV-102 have successfully passed acceptance test and have been certified for three missions. CONCLUSION: The beam position miscompare on the lower right quad antenna was probably caused by failure of the position talkback microswitch inside the coaxial relay. CORRECTIVE_ACTION: The anomalous S-band antenna has been removed and returned to the vendor for failure analysis. Analysis results and corrective action will be tracked via CAR 08F007. CAR ANALYSIS: Analysis located the problem in the antenna switch. This was caused by excessive heat buildup in the switch because it was not sealed and arcing occurred The switches are now sealed with RTV. Close this CAR. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:05:39	Problem	**FIAR**	**IFA** STS-8-V-08	HYD
	GMT: 243:12:11		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Hydraulic System 1 Accumulator Pressure Drop. (ORB)

Summary: DISCUSSION: At 243:12:11 G.m.t. the hydraulic system 1 accumulator pressure dropped to 1700 PSI which initiated an alarm. The crew responded by starting the hydraulic system 1 circulation pump and after one minute the accumulator pressure had increased to 2280 PSI and was steady.

At 243:12:42 G.m.t. the hydraulic system 1 accumulator dropped to 1920 PSI and the circulation pump was started again. Pump was turned off and the hydraulic system 1 accumulator pressure stabilized for the remainder of the mission at about 2350 PSI. Contamination in the unloader valve is the most probable cause for the decrease in hydraulic system 1 accumulator pressure. The contamination cleared after the last pressure cycle and the bootstrap system operated normally for the remainder of the mission. STS-2 had excessive pressure decay on accumulator 3 probably caused by contamination. OV-102 had no problem maintaining accumulator pressure on all 3 hydraulic systems during STS-3 through 5 and no corrective action is required for STS-9. Proper operation of the OV-099 hydraulic system 1 unloader valve will be verified by cycling the valve prior to STS-11. CONCLUSION: The hydraulic system 1 accumulator pressure decrease was most probably caused by contamination in the unloader valve that cleared after the second pressurization cycle. CORRECTIVE_ACTION: None for STS-9. Proper operation of the OV-099 hydraulic system 1 unloader valve will be verified by cycling the valve prior to STS-11. The addition of filters upstream of the priority valve and the unloader valve is being evaluated. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:07:25	Problem	**FIAR**	**IFA** STS-8-V-09	ECLSS
	GMT: 243:13:57		**SPR** 08F001	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Smoke Detector 1B In Avionics Bay 1 Triggered The Alarm Circuit. (ORB)

Summary: DISCUSSION: At about 243:13:57 G.m.t., smoke detector 1B in avionics bay 1 triggered the alarm circuit which gave a smoke alarm. Two alarms occurred and the detector particle concentration level was peaked at 3000 micrograms per cubic meter, which is above the alarm level of 2000 micrograms per cubic meter. Since smoke detector 1A in the same avionics bay did not also trigger an alarm, it is concluded that detector 1B outputs were false. The 1B detector was powered down for the crew sleep period. When the 1B unit was powered up the next day, two additional alarms occurred. Although detector 1B successfully passed an inflight self-test that verified the electronics and the air pump were operating properly, a problem could still have existed in the sensor head. The detector was powered down for the remainder of the flight and there were no further false alarms.

Smoke detector 1B had previously been installed on OV-102 and had exhibited the same anomalous indications during integrated tests prior to STS-1. The unit was removed, reworked, reacceptance tested and then installed on OV-099. The smoke detectors on OV-102 for STS-9 have no open problems. CONCLUSION: The most probable cause of the false alarms on smoke detector 1B was trapped contamination (liquid) inside the test or reference chambers of the detector sensor head. There is no known electronics failure-mode which could cause the indicated response. CORRECTIVE_ACTION: Smoke detector 1B has been removed, replaced and returned to the vendor for failure analysis. If troubleshooting is still unable to locate or isolate the problem, the unit will not be reworked and it will not be returned to the inventory. The results of this activity will be tracked via CAR 08F001. CAR ANALYSIS: Analysis disclosed a cracked solder joint and a loosely staked collector plate at its attach point. Inspection requirements by the vendor have been increased for new production and refurbishment of all units returned from the field. This CAR is closed. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 001:21:10	Problem	**FIAR** EE-0568F , EE-0570F	**IFA** STS-8-V-10	C&T - Navaids
	GMT: 244:03:42		**UA**		**Manager:**
			SPR	**PR**	
			IPR		**Engineer:**

Title: Payload Bay TV Camera D Lost Video And Focus Was Fuzzy On Cameras A And C. (ORB)

Summary: DISCUSSION: On flight day 3, the crew reported that Payload Bay camera D did not have a picture; however synchronization was evident. Ground commands and inflight troubleshooting did not restore the picture and the camera was not used for the remainder of the mission.

On flight day 3, the crew reported difficulty in focusing camera C at infinity and in zooming out the lens fully. The zoom condition cleared on flight day 4. Camera A had a similar focus problem. All three cameras and lens assmeblies were removed and returned to the vendor for failure analysis. Camera D was found to have a failure in the video preamp circuitry on the A9 board. The lens assemblies on cameras A and C were found to have high motor drive side loads due to excessive load torque. The negator springs had been improperly positioned causing the excessive load torque and making the zoom, focus and iris difficult to operate. CONCLUSION: Camera D lost video due to a failure in the video preamp circuitry on the A9 board. Cameras A and C were difficult to focus because the negator springs had been improperly positioned resulting in excessive load torque and high motor drive side loads. CORRECTIVE_ACTION: The number of leaves in the negator spring had been reduced by a change about 1 1/2 years ago to insure proper load torque. This change will be incorporated in the lens assemblies from cameras A and C on OV-099. Old negator springs are installed on the lens assmeblies for OV-102 (STS-9), but all have flown on at least one previous flight without a problem. New negator springs will be installed at the vendor on an as available basis. Corrective actions are to be tracked on FIAR EE-0568F (camera D) and FIAR EE-0570F (camera A and C). EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:18:20	Problem	**FIAR** EE-0569	**IFA** STS-8-V-11	C&T
	GMT: 245:00:52		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: The Text And Graphics System Stopped Producing Image Data. (ORB)

Summary: DISCUSSION: At 245:00:52 G.m.t., the text and graphics system (TAGS) had successfully received and reproduced only 5 of 25 sheets transmitted, after which the TAGS stopped producing image data. Since the teleprinter was also flown on STS-8, there was no mission impact.

Postflight, the cause of the problem was traced to the failure of an integrated circuit in the video processor. Another TAGS unit, with no problems, will be flown on STS-9. CONCLUSION: Failure of the test and graphics to produce image data was caused by the failure of an integrated circuit in the video processor. CORRECTIVE_ACTION: The failed unit was removed and returned to the supplier. Results of the failure analysis on the integrated circuit in the video processor will be tracked via FIAR EE-0569. FIAR ANALYSIS: Failed item is GFE to Orbiter. Failure analysis is tracked within the JSC paper system on FIAR EE-0569. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:08:13	Problem	**FIAR** EE-0567F	**IFA** STS-8-V-12	C&T
	GMT: 244:14:45		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: RMS Elbow TV Camera Lens Had Loose Piece Floating. (ORB)

Summary: DISCUSSION: On flight day 3, the crew reported a problem in obtaining a sharp focus with the RMS elbow TV camera; and an object could be seen floating in front of the picture. The camera continued to be used throughout the mission in the degraded condition.

After the mission, the camera and lens assembly were removed and returned to the vendor for failure analysis. A visual inspection at KSC verified that there was a loose piece within the lens itself. The vendor found a ring loose inside the zoom barrel of the lens. The ring had been improperly staked during assembly of the lens at the vendor. CONCLUSION: Improper staking of a ring inside the zoom barrel of the lens during assembly allowed the ring to float loose inside the lens when the RMS elbow TV camera was used on orbit. CORRECTIVE_ACTION: Assembly procedures are being evaluated at the vendor. Corrective action will be tracked on FIAR EE-0567F. FIAR ANALYSIS: Failed item is GFE to Orbiter. Failure analysis is tracked within the JSC paper system on FIAR RCATVY9299. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 003:11:58	Problem	**FIAR**	**IFA** STS-8-V-13	C&T - Ku-band
	GMT: 245:18:30		**SPR** 08F008	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Ku-Band Antenna Did Not Move To The Commanded Position. (ORB)

Summary: DISCUSSION: At about 245:18:30 G.m.t., the Ku-Band antenna failed to respond to search and designate commands and the actual designated roll/pitch angles were widely separated. During this period the antenna drove against a mechanical stop in the alpha axis for approximately 20 minutes. The drive motor temperature rose nearly 30 deg F before the antenna was designated away from the stop. The antenna may have driven past an electrical stop that would have caused it to do a normal "whip around." About 245:20:00 G.m.t., the anomalous condition cleared and the antenna operated normally for the rest of the mission.

The problem could not be duplicated during postflight troubleshooting on the vehicle and the operation of the antenna was normal. The antenna has been removed and returned to the vendor for failure analysis. The Ku-Band antenna that is installed on OV-102 for STS-9 has operated properly without a problem during checkout and testing. CONCLUSION: The cause of the Ku-Band antenna's failure to respond to position commands for one period of about 90 minutes in flight is unknown. CORRECTIVE_ACTION: The Ku-Band antenna on OV-099 has been removed and returned to the vendor for failure analysis. The results of this investigation will be tracked via CAR 08F008. CAR ANALYSIS: Problem was believed caused by a particle of contamination lodged between the encoder head and disc. The detail process spec for the gimbal mechanism was revised to prevent the introduction of contaminating debris into the encoder assy. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 000:00:11	Problem	**FIAR**	**IFA** STS-8-V-14	HYD
	GMT: 242:06:43		**SPR** 08F020	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Water Spray Boilers 2 And 3 Exhibited Abnormal Temperature Drops Inflight And Orifice 3 Was Missing While Orifices 1 And 2 Were Loose After Landing. (ORB)

Summary: DISCUSSION: After MECO (main engine cut off), the hydraulic WSB (water spray boiler) APU lubrication oil temperature control point of 250 DEG F was reached. Shortly after reaching the control point temperature, WSB 2 and WSB 3 apparently over cooled the APU lubrication oil. At 242:06:42:55 G.m.t., the APU 2

lubrication oil temperature decreased for 17 seconds while at 242:06:43:50 G.m.t., APU 3 lubrication oil temperature decreased for 1 minute. The maximum temperature drop was about 50 DEG F. There ws no indicated excessive water usage noted for WSB 2. A slight increase in water usage (less than 1 lb/min) was noted for WSB 3 during the temperature decrease. In addition, during entry at 248:07:10:00 G.m.t., APU 3 lubrication oil temperature decreased for approximately 3 minutes.

Review of flight data points toward a WSB controller anomaly. It was indicated that 8 to 10 extra water pulses were sprayed into boiler 3 causing the lubrication oil temperature decreases. This same phenomenon has been observed on the qualification WSB unit except only two extra pulses were seen. Water from a WSB storage tank could be depleted if a WSB controller continued extra pulsing during the mission and was not turned off. Analysis of this failure mode results in no ascent issue. Aborts would require water management by turning the WSB controller off and then on; however, sufficient water exists through vehicle roll-out for a normal entry. During postlanding operations, it was found that the WSB 1 and 2 steam vent reducer orifices were loose and WSB 3 steam vent reducer orifice was missing. These orifice inserts were originally installed to prevent freezing of the WSB during ascent. Review of the data indicates the orifices were in place during ascent. There was an unexpected WSB 3 temperature decrease 247:07:30:00 G.m.t. (11 minutes prior to touch down) which may indicate when the orifice was lost. The removed orifices from WSB 1 and 2 exhibited excessive running torque on set screws (normal torque 1 to 1.5 inch-pounds). It is suspected that the orifices were deformed during installation to fit into a 0.03-inch undersized hole. Loss of steam vent orifice inserts during ascent has been evaluated. WSB thermal performance is suspect only when the heat load from an APU is small or if contaminated lubrication oil systems are involved. Even then a freeze up in the WSB will not cause lubrication oil over temperature conditions prior to MECO. WSB thermal performance is always nominal with or without the orifice during descent. CONCLUSION: The most probable cause of the WSB over cooling was the operation of the controllers. WSB 1 and 2 steam vent reducer orifices removed after flight exhibited excessive running torque on set screws. Probably the WSB orifices were deformed during installation in the nozzle vent prior to the last flight. CORRECTIVE_ACTION: Remove WSB 3 primary controller 3A and return to the vendor for investigation. Failure analysis will be tracked by CAR 08F020. The WSB steam vent orifices will be welded in the vent nozzles on STS-9 and subs. The WSB controllers on OV-102 have operated without a problem on previous flights. CAR ANALYSIS: Vendor testing found that circuit noise causes additional pulses to command the lube oil water valve. This only occurs at low heat loads (as the error signal crosses zero value), therefore, the extra pulses at very low heat loads are self-correcting as lube oil temperature transitions from nominal. No corrective action will be taken. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 004:00:16	Problem	**FIAR**	**IFA** STS-8-V-15	RCS
	GMT: 246:06:48		**SPR** 08F004, 08F005	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: RCS Jets L3D Fuel And F3D Oxidizer Valve Leakage. (ORB)

Summary: DISCUSSION: At 246:07:01:08 g.m.t. RCS thruster L3D fuel injector temperature dropped below the redundancy management limit of 20 deg F and was deselected for the remainder of the flight.

At 248:04:02:41 G.m.t. RCS thruster F3D oxidizer injector temperature dropped below the redundancy management limit of 30 deg F and was deselected for the remainder of the flight. Deselection of these thrusters did not affect the mission. CONCLUSION: RCS jets L3D fuel and F3D oxidizer valves exhibited leakage characteristics probably caused by contamination. CORRECTIVE_ACTION: Remove and replace L3D and F3D thrusters. Failure analysis for the thrusters will be tracked on CAR 08F004 for L3D and CAR 08F005 for F3D. CAR ANALYSIS: Both thrusters had minor seal damage due to contamination. Better contamination controls were implemented by the vendor during assembly operations. Close both of these CAR's. [not included in original problem report]
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 002:07:24	Problem	**FIAR**	**IFA** STS-8-V-16	Water and Waste
	GMT: 244:13:56		**SPR** 08F006	**UA**	Management System
			IPR	**PR**	**Manager:**
					Engineer:

Title: Waste Collection System (WCS) Leaked Cabin Air Overboard And The WCS Slinger Labored. (ORB)

Summary: DISCUSSION: During flight, the WCS leaked cabin air overboard at the rate of 1.0 to 1.5 lb/hr. The crew performed a normal procedure in cleaning the slide valve but with no noticeable effect on the leak rate. The vacuum valve was closed during sleep cycles to stop the leak. The crew reported the odor was not noticeable from either the WCS or from the wet trash compartment.

The crew also reported during postflight debriefings that the WCS slinger motor began to labor during the last 24 to 36 hours of the 6-day flight. Postflight, the WCS was removed and shipped to the WCS contractor for analysis. The investigation revealed that the leak was through the commode outlet vacuum valve. The valve was not closing completely because of excessive play in the closure linkage. The slowing of slinger rotation in connection with the laboring motor was similar to that experienced on previous flights, and appears to be characteristic of the present design and hardware. Investigation also showed there had been some by-pass leakage of fecal material around the slinger filter and into the fan separator. CONCLUSION: The WCS leakage was caused by excessive play in the closure linkage. The slinger noise is attributed to the slinger motor laboring as the load increases during the flight. This condition has occurred on previous flights. The slinger filter seal was not positioned properly. This resulted in by-pass leakage of fecal materials. CORRECTIVE_ACTION: The WCS unit in OV-102 will be replaced with the OV-099 WCS unit. The commode outlet vacuum valve open/close linkage on the OV-099 WCS unit has been adjusted to insure complete closure of the valve. The upper tines on the slinger were removed

for STS-9, and the crew will be provided with a procedure on how to operate the WCS without the slinger turning. Implementing this procedure will be a crew option for later in the flight. Work is continuing to alleviate the operational slow-down of the slinger. The seal around the slinger filter will be verified to avoid by-pass leakage. Failure analysis will be tracked on CAR 08F006. CAR ANALYSIS: Overboard leakage was determined to be caused by incomplete closure of the ball valve that connects the WCS to overboard vacuum or the humidity separators. Incomplete ball valve closure was caused by linkage tolerance build-up and improper pin location. WCS assembly has been revised to remove backlash from linkage (effective on all flights). [not included in original problem report]
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** 000:14:28	Problem	**FIAR**	**IFA** STS-8-V-17		HYD
	GMT: 242:21:00		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Water Spray Boiler 1 GN2 Pressure Regulator Relief Valve Leak. (ORB)

Summary: DISCUSSION: Water Spray Boiler 1 GN2 pressure regulator relief valve leakage was observed after N2 isolation valve closure following APU shutdown. The leakage was low (0.05 PSI/HR) and had no effect on the mission. This is similar to the leakage observed on prior missions.

CONCLUSION: Water Spray Boiler 1 GN2 pressure regulator valve leakage was of low magnitude and had no effect on the mission. CORRECTIVE_ACTION: The Water Spray Boiler 1 low pressure GN2 relief valve will be cycled during turnaround for STS-11 and the leakage rate verified to insure that the specification is not exceeded. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** 001:10:03	Problem	**FIAR**	**IFA** STS-8-V-18		Water and Waste
	GMT: 243:16:35		**SPR**	**UA**		Management System
			IPR	**PR**		**Manager:**
						Engineer:

Title: Supply Water Dump Did Not Occur. (ORB)

Summary: DISCUSSION: About 34 hours into the STS-8 mission, the crew attempted to dump supply water tank B. Tank B quantity did not decrease. The dump was attempted 1 hour later and was completed successfully.

The data were reviewed during the time of the attempted water dump. The line heater and the nozzle heaters were functioning normally. The nozzle temperature was increasing and the line temperature was normal. The discrete data for the Tank B outlet valve, the dump isolation valve, and the dump valve indicated that the crew had followed the correct procedure. The design of the solenoid valve was examined and it was determined that an incorrect valve talkback was not possible, since the actuated portion of the valve also contacted the talkback microswitch. The dump was repeated 1 hour later with no problems. During the remainder of the mission, 8 water dumps were performed; all were completed successfully with no anomalies. CONCLUSION: The problem most likely was caused by ice in the nozzle area which stopped flow until it was melted. Alternate dump procedures exist in the unlikely event the dump nozzle would not clear. CORRECTIVE_ACTION: NONE EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 005:01:28	Problem	**FIAR**	**IFA** STS-8-V-19	DPS - GPC
	GMT: 247:08:00		**SPR** 08F009	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: GPC 1 And 2 Fail-To-Sync. (ORB)

Summary: DISCUSSION: At about 247:08:00 G.m.t., GPC's (General Purpose Computers) 1 and 2 had a redundant set fail-to-sync and GPC 1 encountered a GPC bite due to the attempted execution of an illegal instruction. Both GPC's stayed in the common set. A subsequent initial program load for GPC 1 was successful and both computers operated in the redundant set for the remainder of on-orbit operations. String assignments were interchanged between GPC 1 and GPC 4 for entry and all computers operated normally through landing.

Analysis indicated that the GPC 1 fail-to-sync was caused by attempting to "close" the Mid Frequency Exec (MFE) process in GPC 1 prior to the normal "close" point. The early close was due to the alteration of a single bit in CPU register-one and was most probably the result of a transient hardware anomaly. The altered bit caused eventual execution of an illegal instruction which triggered the Bite message. There is no plausable basis for a software error. GPC 1 was removed, replaced and shipped to JSC for testing in SAIL. IBM is performing a detailed timing analysis of the logic paths implicated in the transient event involving about 16 integrated circuits. Results of this analysis will determine the specific troubleshooting to be done. CONCLUSION: The GPC 1 and 2 fail-to-sync was caused by the alteration of a single bit in CPU register-one of GPC 1. The bit alteration resulted in an early "close" of the MFE in GPC 1 causing the redundant set fail-to-sync. The bit alteration in GPC 1 was most probably the result of a transient hardware anomaly. CORRECTIVE_ACTION: GPC 1 on OV-099 has been removed, replaced and returned to JSC for testing at SAIL. Failure analysis for GPC 1, serial number C28/I23, will be tracked on CAR 08F009. CAR ANALYSIS: Results from testing at IBM (Owego) and IBM (JSC) showed operating margins on both units were within acceptable limits. It was concluded that four IC's could have possibly contributed to the one-time problem and those will be changed when both CPU's (SN 028 and SN 002) are processed through Owego for the Schotsky purge. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** 005:18:19	Problem	**FIAR**	**IFA** STS-8-V-20		GN&C
	GMT: 248:00:51		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: IMU-2 Downmoded From Operate To Standby. (ORB)

Summary: DISCUSSION: At about 248:00:51 G.m.t., IMU (inertial measurement unit) -2 went to standby. IMU-2 was reactivated, realigned and reselected for redundant set operations. IMU-2 operated normally for the remainder of the flight.

The most probable cause of the IMU dropping out of "operate" is a transient failure in the command path from MDM (Multiplexer/Demultiplexer) FF2 to the IMU. The specific path in question can almost certainly by narrowed to the single "operate" discrete that originates in the MDM (from GPC software). Although the discrete originates in the MDM, it is also plausible that the transient occurred within the IMU side of the interface. The entire discrete interface was investigated thoroughly during postflight testing at KSC. Extensive closed-loop and open-loop tests were performed to verify the command path including flexing of interconnecting cables. The open-loop tests were structured to maximize detection of any MDM transient anomalies during a 3-hour interval as the MDM warmed up from a "cold start". Experience has shown that certain types of transient phenomena occur more readily during such thermal transitions. Experience has also shown that most transient conditions are extremely difficult to repeat even during extensive environmental testing at the vendor. Given the low probability of repeating the anomaly at even the MDM or IMU vendor and the redundancy inherent in 3 IMU's, no further action is warranted at this time. Fly OV-099 as is for STS-11 and subsequent flights. There is no evidence of any generic condition that would impact OV-102 for STS-9. CONCLUSION: The downmoding of IMU-2 from operate to standby was probably caused by a transient failure in the command path from MDM FF2 to the IMU. CORRECTIVE_ACTION: NONE. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-8-V-21		C&T
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: OPS 2 Recorder Rewind Caused Interference on OPS 1 Recorder Playback. (ORB)

Summary: DISCUSSION: During on-orbit operations the OPS 2 recorder, when being repositioned, interfered with OPS 1 recorder data playback. The same problem occurred on the OPS 1 recorder serial number 1014, during the STS-7 mission. This indicated that the modification to inhibit serial data output during rewind operations was also not incorporated on the OPS 2 recorder. This was confirmed during postflight troubleshooting at KSC.

Since loss of the OPS 2 recorder rewind feature during OPS 1 recorder dump has only minor impact on recorder operations, the OPS 2 recorder, serial number 1016, is useable as is for flight. Neither of the OPS recorders on OV-099 should be repositioned when the other recorder is in the dump mode. Both OPS recorders on OV-102 were tested after installation at KSC and proper operation of the rewind inhibit modification was verified. CONCLUSION: The modification to inhibit serial data output during recorder rewind has not yet been incorporated in the OPS 2 recorder on OV-099. Absence of the inhibit signal does not cause loss of data if the recorder rewind operation is not used during dump of the other OPS recorder. CORRECTIVE_ACTION: The OPS 1 and 2 recorders will be flown as is on OV-099 for STS-11. When other flight units become available, the anomalous recorders will be removed and returned to the vendor for incorporation of the required modification. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE ON STS-9. On STS-11 the rewind feature on one OPS recorder will be lost while the other OPS recorder is dumping data. The recorders can be repositioned by stored program command while the spacecraft is not over a telemetry station, which precludes operational impact.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-8-V-22		MECH
	GMT: Postlanding		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Several Retainer Washers Found Broken on Right Main Brakes (ORB)

Summary: DISCUSSION: Several retainer washer pieces were found loose in the right main gear brakes during postflight disassembly. One broken piece of washer was found in place and 6 retainer washers were missing on the right outboard brake. One broken piece was also found in place and 4 retainer washers were missing on the right inboard brake. The no. 4 rotors were damaged on both right hand brakes. The left hand brakes, even though subjected to higher energy, did not have similar damage.

Brake damage on STS-7 was attributed to cracked retainer washers. An eddy current screen was initiated after assembly and run-in and the brakes screened for STS-8 and STS-9 (OV-102). STS-8 damage was similar to that found on STS-7 but significantly less in that no rotors, stators, or pads were broken and no wheel binding occured. Evidence from STS-8 does suggest that the TZM washer, even though not cracked at installation, may be susceptible to subsequent cracking possibly caused by brake/hydraulic dynamic interaction. This type of brake damage has not bee noticeable on previous flights of OV-102 and appear to be peculiar to OV-099. Planning is in progress to conduct high-frequency pressure pulse tests on brakes at the vendor and to add instrumentation on OV-099 to better understand any instability problems. In addition, cross talk ground tests are being evaluated for OV-099, where each of the 4 electro-hydraulic channels would be commanded independently and in combinations for a more detailed understanding of the dynamic interactions. CONCLUSIONS: Retainer washer failures on the right main gear brakes on STS-8 were similar to but fewer than the washer failures on STS-7. Evidence from STS-8 suggests that brake/hydraulic dynamic interaction may have caused the retainer washers to crack and fail. The damage experienced is not a safety issue. Hard braking was demonstrated on STS-6 (OV-099) as a development test objective. Brake damage due to broken retainer

washers has not been observed on the previous flights of OV-102. CORRECTIVE ACTION: High-frequency pressure pulse tests will be conducted on the brakes at the vendor. Instrumentation will be added on OV-099 to better understand any instability problems. Ground tests of the electro-hydraulic channel-to-channel response are also being evaluated for OV-099. No corrective action is required for OV-102. EFFECTS ON SUBSEQUENT MISSIONS: NONE [The following was not in the original problem report. see STS-41B-V-29] [{DISCUSSION: Postflight inspection after STS-41B found 3 retainer washers broken or missing, carbon edges chipped on 23 brake lining segments and 18 drive clips peened or bent on the right outboard brakes. Carbon liner edge chipping and retainer washer failures have occurred on the right main gear brakes for the last 4 flights. Brake/hydraulic dynamic interaction causes the carbon liner edges to chip allowing the carbon to wedge up under and fail the retainer washers. This dynamic interaction also causes the peening of the drive clips. Ground tests have been unable to induce a similar dynamic response. Instrumentation will be added to OV-099, starting the flight after STS-41C, to better understand the brake/hydraulic dynamic interaction. An industry wide committee met at JSC in January, 1984, and reviewed the total brake design. They concluded that the Orbiter problems being experienced were not unusual and no safety issues existed. CONCLUSION: Brake/hydraulic dynamic interaction caused carbon liner edge chipping and subsequent retainer washer failures. Retainer washer failures have occurred on the right main gear brakes for the past 4 flights. This damage is not a safety issue. Hard braking was demonstrated on STS-6 (OV-099) as a DTO (Develepment Test Objective). CORRECTIVE_ACTION: A comprehensive program plan for brake system improvement has been developed and is in evaluation. A detailed math model is being developed and carbon material characterization tests are in progress. Instrumentation will be added to OV-099 starting with the flight after STS-41C to better understand the brake/hydraulic dynamic interaction. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE}]

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-8-V-23		MECH
	GMT: Postlanding		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Nose Strut Thruster Piston Found On Runway. (ORB)

Summary: DISCUSSION: The nose gear thruster piston was found on the runway approach approximately 7700 feet prior to touchdown.

Under normal conditions the nose gear assist piston is stroked by a spring in the housing such that the piston moves with the nose gear mechanism during its gravity and aerodynamic drag deployment. After a 2-second period a pyro is fired resulting in: 1. An assist to the gear deployment through the piston mechanism if the nose gear has not reached the deployed position, or 2. No reaction if the piston is fully extended to the end of the housing by the spring. It is most probable that the piston did not move to the fully extended position on STS-8. This was due to the inability of the piston spring force to overcome 1. A high friction condition caused by lack of lubrication on the piston "O" ring, or 2. A vacuum on the pyro end of the piston created by on-orbit leakage past the piston "O" rings. CONCLUSION: The nose gear thruster was not fully extended by the spring. When the pyro subsequently fired, it drove the piston through the end of the actuator. The nose gear deployed normally without the assistance of the pyro-actuated piston. CORRECTIVE_ACTION: An additional spring will be added to the thruster piston and lubrication will be verified for OV-102, STS-9, and subs. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 004:02:28	Problem	**FIAR**	**IFA** STS-8-V-24	ECLSS
	GMT: 246:09:00		**SPR**	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Potable Water Dump Line Primary System "B" Thermostat Failed. (ORB)

Summary: DISCUSSION: When the water dump line heater system was reconfigured from A to B, the potable water dump heater control band shifted from 80-100 deg F to approximately 90-115 deg F. This shift could have been caused by a normal difference in control bands from one system to the other or it could have indicated a failure of the B "primary" thermostat since the "overtemp" thermostat controls in a higher temperature band. The postflight tests at KSC measured the temperature at the thermostats and confirmed that the B system "primary" thermostat controls in a temperature band 9 deg F higher than the A system.

CONCLUSION: The control band shift observed was caused by a difference between primary thermostat control bands. No failure occurred. CORRECTIVE_ACTION: NONE EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** 005:15:56	Problem	**FIAR**	**IFA** STS-8-V-25	EPD
	GMT: 247:22:28		**SPR** AC6684F	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Aft Motor Control Assembly 2 Relay Operation Status 2 Was Erroneous. (ORB)

Summary: DISCUSSION: At 247:22:28 G.m.t., telemetry data showed that the aft Motor Control Assembly (MCA) 2 relay operation status 2 indication (V76X2262E) was erroneous. Although power was removed from all relays, an energized relay was indicated. About 8 hours later, the indication returned to normal and remained proper for the rest of the mission.

The operation status indication monitors the position of 14 relays (contacts serially connected) which are used to control vent doors 8 and 9, the aft RCS isolation valves and the OMS crossfeed valves (fuel and oxidizer). The same anomaly occurred during preflight operations, but cleared after several cycles of the vent door relay. Postflight, the relay position status circuitry was verified correct and the voltage input to the MDM (status indication) was proper. Since the relays performed their required functions, the most probable cause of the anomalous indication was contamination in the position monitor contacts of one of the relays for the operation status 2 indication. There is no concern for STS-9 since the OV-102 relay operation status has operated properly on all previous flights and the relay contacts involved are not in a control loop.

MCA 2 was removed and replaced on OV-099. CONCLUSION: The most probable cause of the erroneous MCA status is contamination in one of the relay position monitoring contacts to the operation status 2 indication. CORRECTIVE_ACTION: MCA 2 was removed, replaced and returned to the contractor for failure analysis. Results of the MCA 2 failure analysis will be tracked on CAR AC6684F. CAR ANALYSIS: Unable to duplicate the failure post-flight. However, the MCA 2 has been changed out and a spare has been installed. The changeout was accomplished in an attempt to isolate the potential problem to the MCA or the vehicle. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** Postlanding	Problem	**FIAR**	**IFA** STS-8-V-26		MECH
	GMT: Postlanding		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Right ET Attach Bolt Hole Plugger Cocked. (ORB)

Summary: DISCUSSION: Postlanding inspection of the ET separation system revealed that the right aft ET attach bolt hole plugger had not closed the 2.5 inch diameter bolt hole due to interference by a frangible nut fragment and a firing line connector. Pieces of debris fell on the runway after the ET door was opened and other pieces were found in a structural cavity adjacent to the door hinge.

The purpose of the hole pluggers is to minimize the loss of debris through the aft attach bolt holes at ET separation. It has always been recognized that a hole plugger could be jammed partially open by debris. This had happened once during the aft attach separation qualification tests and was not considered a hardware failure. The possibility of any debris jamming the ET doors is considered to be remote. The hole pluggers were incorporated to reduce this probability even further, however, they are not a guarantee against the loss of any debris. CONCLUSION: Debris cocked the right ET attach bolt hole plugger. The function of the hole pluggers is to minimize the loss of debris through the ET aft attach bolt holes at ET separation. The possibility of debris jamming the ET doors is considered remote. The ET door mechanisms are designed to be jam resistant an the doors can be recycled, if necessary, during the closing sequence. CORRECTIVE_ACTION: NONE
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-8-V-27		TPS
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Thermal Protection System (TPS) Damage. (ORB)

Summary: DISCUSSION: Overall, the performance of the TPS was better on STS-8 than any previous flight. The launch impact damage to the lower surface was significantly less than any previous flight and no tiles on the lower surface were required to be removed due to impact damage.

In addition, very minor slumping occurred on three tiles behind the nose cap. The AFRSI test samples at four locations sustained no visual degradation. A slight over temperature of FRSI occurred along some locations on each mid fuselage side and on the left hand OMS pod. The nose cap and wing leading edge carbon panels did not have any visual degradation. 1. Four tiles on the OMS pod forward section, two tiles on the upper body flap and one tile on the right hand aft RCS base region were required to be replaced due to impact damage. 2. The fabric insulation around main engine three was breached and torn about three feet in length, similar to the occurrance on main engines 1 and 2 on the STS-7 flight. 3. Additional tile slumping occurred on the lower row of tiles on the inboard side of the outboard elevons and some tiles had apparent coating cracks. The tile slumping on the left hand side was more severe than the right hand side and appeared to be aggravated by loose gap filler protrusion which perturbed the local heating. 4. The AFRSI repairs on the outboard lower section of both aft RCS pods were degraded slightly. 5. Tile slumping occurred on the leading edge of the lower access panel between panels 6 and 7. CONCLUSION: 1. The tile damage to the OMS pod, body flap and aft RCS was attributed to particle impact during ascent. 2. The cause of the main engine insulation damage is unknown. 3. The additional tile slumping was anticipated since these tiles had previously slumped on STS-7 and were baselined as possibly having only one mission use. 4. The AFRSI repairs on the aft RCS pods apparently were overheated to temperatures above 800 DEG F from plume implingement or entry heating. Also some degradation of stitches has been observed. 5. Detailed inspection of the lower access panels showed minor slumping but no evidence of flow through. The thermal barriers were also breached. CORRECTIVE_ACTION: 1. The damaged OMS pod, body flap and aft RCS tiles will be replaced. 2. The insulation around main engine three will be replaced. 3. These tiles will either be replaced or possibly machined in place to a larger radius for reuse. 4. The degraded AFRSI blankets will be replaced with new AFRSI or possibly LRSI tiles. 5. The slumping tiles and thermal barriers will be replaced or repaired. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** 001:00:28	Problem	**FIAR**	**IFA** STS-8-V-28		PYLD
	GMT: 243:07:00		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Debris Out Of Payload Bay Immediately After Payload Deployment. (ORB)

Summary: DISCUSSION: The initial review of video coverage of the INSAT-1B deployment sequence indicated that an unidentifiable object appeared to come from the payload bay during that sequence. The object appeared to be traveling at several times the deployed payload speed relative to the orbiter and it seemed to contact the satellite.

As a result, a detailed inspection of the payload bay was conducted immediately after the payload bay doors were opened during postlanding operations. The inspection consisted of a 6-hour TV scan of the bay and a detailed visual inspection by a team composed of NASA, contractor, and vendor personnel. No pieces of the orbiter or the ASE (Airborne Support Equipment) were identified as missing. Concurrent with the effort discussed in the previous paragraph, an extensive video and film review was conducted. The 16 mm hand-held camera film did not show the object seen in the video coverage. The 70 mm still picture taken in sequence as the payload was deployed also did not show any loose objects leaving the payload bay. The results of the detailed video review were as follows: 1. The object appeared to be irregularly shaped and tumbling as it moved through the TV camera field of view (FOV). 2. The entire path of the object is consistent with the operation of the camera and the optical characteristics of the lens, i.e., tilting during the initial 1.6 seconds of the 5-second period when the particle was in the FOV, no camera control changes during the next 2.4 seconds, and then zooming in during the final 1.0 second. 3. There is no evidence from the video that the particle struck the INSAT. 4. The particle most likely passed between the TV camera (located on the forward bulkhead, starboard side) and the INSAT when the INSAT was approximately 56 feet above the payload bay. The most probable explanation of these events is that the object was a particle moving between the TV camera and the satellite. The particle appeared to move in a curved path because of the characteristics of the lens used on the video camera. A particle to the left of center and moving away from the camera would appear to curve toward the center of the picture - concave to the left. The apparent change in the direction of the object as it appeared to pass the payload was verified as being caused by zooming of the lens. CONCLUSION: The object seen in the video of payload deployment was most probably a particle moving between the video camera and the satellite. It appeared to change direction when the camera lens was zoomed. There is no evidence from the video that the particle struck the INSAT. CORRECTIVE_ACTION: NONE EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-8-V-29		ECLSS
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Cabin Debris. (ORB)

Summary: DISCUSSION: The crew reported that as the flight progressed, there was a noticeable increase in the amount of floating debris and dust in the cabin. The various filters and screens were cleaned by the crew as scheduled, and it was noted that as anticipated there was not very much material being captured by the cabin fan filters. These filters were cleaned two times during the flight and the crew noted a bluish-gray material around the periphery of the filter. The center of the filter was free of any trapped material despite the large amount of debris floating in the cabin. There was so much debris and dust in the air that the crew reported they were uncomfortable. Also stowing and destowing activities aggravated the situation. Prior to entry the crew reported that they had to wipe clean the CRT's and panels to restore acuity. KSC noted during their postflight inspection of the cabin interior that the level of dust and debris was about the same as on previous flights.

All cabin air circulates through the flight deck avionics boxes which are equipped with inlet air screens that collect a substantial percentage of the larger sized debris. Some of the more accessible screens were cleaned by the crew inflight and the crew noted that a significant amount of debris had collected on these screens. Rockwell and Hamilton-Standard are evaluating changing the cabin fan filters from 300 microns (.017") to 100 microns (.004"). This change is primarily to protect the water separator from debris that can pass through the 300-micron filter. Improved as well as more frequent cleaning during ground operations, and more frequent use of the vacuum cleaner inflight should help to keep the amount of floating debris and dust at a tolerable level. The vacuum cleaner can also be used after meals or stowage activities to clean floating debris or dust from the air. CONCLUSION: The debris and dust in the cabin was most probably generated by crew activities and by the release of trapped particles from lockers and stowed items and from crevices in the cabin where dust was trapped during ground operations. CORRECTIVE_ACTION: KSC has instituted daily cleaning procedures for the crew module to keep the contamination from ground operations to a minimum. Inflight, the crew will use the vacuum cleaner more often to catch the dust as it collects on the accessible air inlet screens, the CRT's and the panels. Modification of the cabin fan filter is being evaluated to protect the water separator from debris. EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification	Documentation		Subsystem
MER - 0	**MET:** Prelaunch	Problem	**FIAR**	**IFA** STS-8-V-30	ECLSS
	GMT: Prelaunch		**SPR** 08F016	**UA**	**Manager:**
			IPR	**PR**	
					Engineer:

Title: Odor From Lithium Hydroxide Cartridges. (ORB)

Summary: DISCUSSION: During prelaunch activities and at several times during the mission, the crew reported being irritated in the mouth, nose and throat when the LIOH cannisters were replaced. The irritant was not visible, but was assumed to be dust from the LIOH cartridges. The effect of the irritation was hacking and coughing. Prelaunch, during a cartridge change on the middeck, the irritation was also observed on the flight deck. The cartridges were changed on schedule during the mission with irritation occurring during several changes. The crew started using quarantine masks that were on board during cartridge changes and this resulted in the irritation being eliminated during the remainder of the flight.

Two unused LIOH cartridges were returned to JSC for analysis. Swab samples were taken from the cartridges and wrappers. Five (5) to 6 milligrams of LIOH dust were found. Seven unused cartridges from the mission have also been returned to the vendor for an investigation which is currently underway. CONCLUSION: The most probable cause of the irritation to the crew when some of the LIOH cartridges were replaced was LIOH dust which caused coughing and hacking. CORRECTIVE_ACTION: All LIOH cartridges to be used for the STS-9 mission will have the flight wrappers removed and the cartridges vacuum cleaned and repackaged in new flight wrappers. The addition of masks to the stowage list and implementation of a procedure to turn off the cabin fan during LIOH cartridge changes is being considered. Additional analysis and corrective action, if required, will be tracked on CAR 08F016. CAR ANALYSIS: The analysis disclosed excess amounts of LIOH dust. A new vacuum cleaning process was developed and tested prior to the next flight. All cartridges will be vacuumed prior to use. Close this CAR. [not included in original problem report] EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:** 000:00:00	Problem	**FIAR**	**IFA** STS-8-V-31		DPS
	GMT: 242:06:32		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Master Timing Unit Accumulator Bite Indications. (ORB)

Summary: DISCUSSION: Starting at T-0 when the master timing unit (MTU) was reset, the voted demand channels of accumulators B and C (bits 10 and 11) alternately displayed toggling good/failed (zero/one) data in the MTU bite word. This condition was also present during STS-7 and posed no problem for either flight.

The status of the three MTU accumulators is provided by the MTU bite words, bits 9, 10 and 11 (voted demand A, B and C). The "read" of the MTU voted demand channel by the PCM-MU causes a comparison of the accumulators. If the "read" coincides with the update or rollover of an accumulator, a miscompare occurs and a bite is seen. This is not a true failure. The condition occurs randomly during PCM-MU power up or at MTU reset and can continue until either the power to the PCM-MU is cycled OFF/ON or until another MTU reset command is given. Postflight data review indicates that only one accumulator experienced a miscompare at any given instant. Also, the toggling failed indication alternated between accumulators B and C, which is indicative of a PCM-MU read/accumulator update coincidence. A hardware problem is not likely, and the condition does not impact mission operations. CONCLUSION: The toggling accumulator bite was caused by the PCM-MU time request being coincident with the MTU accumulator updates. CORRECTIVE_ACTION: None. The toggling MTU accumulator bite indication can be corrected in flight by a MTU reset command. This condition will not be carried as an anomaly on the problem tracking list should it occur again on future flights.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	**MET:**	Problem	**FIAR**	**IFA** STS-8-V-32		TPS
	GMT:		**SPR**	**UA**		**Manager:**
			IPR	**PR**		
						Engineer:

Title: Right Front Window (No. 4) Pitted. (ORB)

Summary: DISCUSSION: The postflight examination of the windows revealed a 0.0073-in. deep pit in window no. 4. The pit was located midway between the top and bottom and 5 in. from the center post. Each orbiter window is composed of 3 panes; the outer pane is 0.061-in. thick fused silica and is used for thermal protection. The 2 inner panes provide cabin-pressure integrity.

Reduced structural strength of the outer thermal pane could result from excessive pitting and result in loss of this pane during the latter phase of entry after the entry heating phase. However, loss of the thermal pane could be safely sustained during this latter phase of a normal entry. A stress analysis has been made and the results indicate the window is satisfactory for approximately 20 more missions with the existing pit. CONCLUSION: The pit was probably caused by a meteoroid impact. Loss of the outer thermal pane will not result in loss of cabin pressure. The pit does not adversely affect the structural integrity of the window to the extent that removal and replacement are required. CORRECTIVE_ACTION: The pitted pane need not be removed for the next mission due to any structural integrity problems.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE.

Tracking No	Time	Classification		Documentation		Subsystem
MER - 0	MET:	Problem	FIAR	IFA STS-8-V-33		PYLD
	GMT:		SPR	UA		Manager:
			IPR	PR		
						Engineer:

Title: Barrel Nuts Loose On Mid Fuselage Frames In Payload Bay. (ORB)

Summary: DISCUSSION: Postflight inspection showed 5 barrel nuts lying loose in the bottom of the payload bay. These nuts weigh 0.408 ounces each and are used to attach the payload keel fitting to the mid fuselage frames under the payload bay liners. When there is no keel fitting installed, the nuts are retained in the orbiter structure by a spring clip. Further examination found 7 locations without barrel nuts. Since we recovered only 5 nuts, 2 nuts are still missing.

Location of the missing barrel nuts is as follows: Orbiter bulkhead no. 636 right and left, no. 863 right, no. 919 left, no. 979 right, no. 1040 right and no. 1090 left. A review of manufacturing records for OV-099 determined that 17 of the 33 holes were drilled oversized (0.002 to 0.006 inch) for these nuts. All the missing nuts, except the one at location no. 636 right, were from oversized holes. Only 2 of the 33 holes on OV-102 are oversized. CONCLUSION: The missing barrel nuts were installed in oversized holes which probably contributed to their coming loose. The two nuts that have not been found may still be in the payload bay. The nuts are under the payload bay liner and it is difficult for the loose nuts to get above the payload liner. Only 2 holes on OV-102 are oversized. CORRECTIVE_ACTION: Fly as is for STS-9. For STS-11 and subsequent, the barrel nuts will be retained in the mid fuselage frames by lockwires in addition to the spring clips.
EFFECTS_ON_SUBSEQUENT_MISSIONS: NONE
